

## Central Valley Regional Water Quality Control Board

22 February 2018

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### REVIEW OF THE SAN JOAQUIN RIVER CHLORPYRIFOS AND DIAZINON 2016 WATER YEAR ANNUAL MONITORING REPORT – EAST SAN JOAQUIN WATER QUALITY COALITION AND WESTSIDE SAN JOAQUIN RIVER WATERSHED COALITION

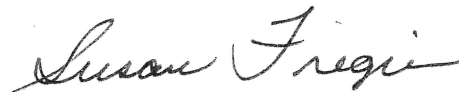
Thank you for submitting the San Joaquin River Chlorpyrifos and Diazinon 2016 Water Year Annual Monitoring Report (AMR) for the Total Maximum Daily Load (TMDL) compliance monitoring on 1 May 2017. The TMDL AMR is a joint effort by the East San Joaquin Water Quality Coalition (ESJWQC) and the Westside San Joaquin River Watershed Coalition (Westside Coalition) to meet the conditions of the Monitoring and Reporting Program Orders No. R5-2012-0116-R3 and R5-2014-002-R2, and the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins for the Diazinon and Chlorpyrifos Runoff in the San Joaquin River Basin.

Central Valley Water Board staff reviewed the TMDL AMR for completeness and accuracy, including data collection and reporting requirements, as well as evaluation of compliance with the seven Basin Plan requirements. The monitoring and reporting program included collecting information necessary to adequately address the seven monitoring objectives outlined in the Basin Plan. However, continued exceedances in some tributaries of the San Joaquin River indicate that additional actions are required to meet water quality objectives.

If you have any questions regarding the TMDL AMR review, please contact Yared Kebede at (916) 464-4828 or by email at [Yared.Kebede@waterboards.ca.gov](mailto:Yared.Kebede@waterboards.ca.gov).



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Enclosure: Staff Review of 2016 Water Year TMDL AMR  
TMDL AMR Review Checklists

## Central Valley Regional Water Quality Control Board

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DATE: 23 January 2018

SUBJECT: REVIEW OF SAN JOAQUIN RIVER CHLORPYRIFOS AND DIAZINON  
ANNUAL MONITORING REPORT FOR 2016 WATER YEAR – EAST SAN  
JOAQUIN WATER QUALITY COALITION AND WESTSIDE SAN JOAQUIN  
RIVER WATERSHED COALITION

On 1 May 2017, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) received the San Joaquin River Chlorpyrifos and Diazinon 2016 water year (1 October 2015 – 30 September 2016) Annual Monitoring Report for compliance with the Total Maximum Daily Load requirements (TMDL AMR). The TMDL AMR reports on the East San Joaquin Water Quality Coalition (ESJWQC) and the Westside San Joaquin River Watershed Coalition (Westside Coalition) joint monitoring program.

Central Valley Water Board staff reviewed the 2017 TMDL AMR to determine compliance with monitoring and reporting requirements pursuant to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) and the Monitoring and Reporting Program (MRP) Orders No. R5-2012-0116-R3 and R5-2014-0002-R2. In this memorandum, staff presents a review of the monitoring results and outcomes of actions taken to meet the seven objectives described in the Basin Plan:

### **1. Determine compliance with established water quality objectives and the loading capacity applicable to diazinon and chlorpyrifos in the San Joaquin River**

The Basin Plan requires that the loading capacity be calculated for the six designated compliance points in order to determine compliance with the water quality objectives (WQOs) and the loading capacity in the San Joaquin River (Basin Plan, page IV-36.03). The Coalitions continue to collect and analyze water samples from the San Joaquin River as directed by the 10 January 2013 letter from the Executive Officer. For the 2016 WY, the ESJWQC collected samples six times from two sites along the San Joaquin River (San Joaquin River at Hills Ferry Road and San Joaquin River at the Maze Boulevard Bridge), and utilized the USGS monitoring data from San Joaquin River at Airport Way near Vernalis as part of the ESJWQC's participation in the Delta Regional Monitoring Program. The Westside Coalition collected samples monthly from January to September at three sites (San Joaquin River at Sack Dam, San Joaquin River at Highway 165 near Stevinson, and San Joaquin River at Las Palmas Avenue near Patterson). This monitoring was adequate to

assess compliance with the water quality objectives and loading capacity because samples were collected at an appropriate frequency at all sites during critical periods of pesticides loading.

The San Joaquin River TMDL loading capacity was met during the 2016 WY monitoring since there were no exceedances of the chlorpyrifos or diazinon water quality objectives at the compliance monitoring sites in the lower San Joaquin River. In addition, the chlorpyrifos and diazinon water quality objectives have been achieved since the December 2010 compliance deadline. The loading capacity has also been achieved since the last exceedance at the Las Palmas Avenue site in March 2013. However, diazinon and chlorpyrifos were detected in samples collected at the San Joaquin River at the Airport Way Bridge near Vernalis site, indicating the potential for dormant spray and irrigation runoff events to cause exceedances, especially if monitoring captured the peak concentrations.

## **2. Determine compliance with established load allocations for diazinon and chlorpyrifos**

Load allocations for diazinon and chlorpyrifos are assigned to five combined subareas discharging into a given reach of the San Joaquin River (Basin Plan, page IV-36.03). The load allocations are established by subarea and are calculated using the combined additive toxicity formula. Load allocations apply to the discharge point to the San Joaquin River and not to the whole tributary stream reach (page 21, Final Staff Report<sup>1</sup>). Monitoring occurred at the six San Joaquin River main stem sites as well as in 32 tributary sites, 16 in each Coalition region, to characterize the discharges from the San Joaquin River subareas. This monitoring was generally adequate to determine compliance with load allocations.

There were two exceedances of the chlorpyrifos WQO in samples collected from ESJWQC tributaries (94 samples analyzed). A total of four chlorpyrifos exceedances occurred in the Westside Coalition region (89 samples analyzed). Diazinon was not detected in any sample. Overall, 95% of the samples collected from the Westside Coalition region were compliant with the load allocation during the 2016 WY, higher than the load allocation compliance rate in the 2015 WY (93%) and 2014 WY (89%).

Given that instantaneous loads are calculated and reported only for individual tributaries and not for the entire subarea assigned a load allocation (Appendix IV), it is not easy to ascertain if the load allocation was exceeded in the combined subarea on the occasion when an exceedance occurred in one of the tributaries. Based on the monitoring results at tributary sites closest to the discharge point into the River, the load allocation was potentially exceeded in two subareas during the 2016 WY<sup>2</sup>:

- The combined Turlock, Merced, and Greater Orestimba subareas potentially exceeded the load allocation in July, November and January. Chlorpyrifos exceedances were observed in the ESJWQC region at Merced River @ Santa Fe (November), Highline

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<sup>1</sup> Beaulaurier, D., Karkoski, J., Davis, G., McClure, D., Menconi, M., McCarthy, M. 2005. Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River basins for the Control of Diazinon and Chlorpyrifos Runoff into the Lower San Joaquin River. California Regional Water Quality Control Board, Central Valley Region. Sacramento, CA. Final Staff Report, October 2005. <[http://www.waterboards.ca.gov/rwqcb5/water\\_issues/tmdl/central\\_valley\\_projects/san\\_joaquin\\_op\\_pesticide/final\\_staff\\_report/index.shtml](http://www.waterboards.ca.gov/rwqcb5/water_issues/tmdl/central_valley_projects/san_joaquin_op_pesticide/final_staff_report/index.shtml)>

<sup>2</sup> Although a chlorpyrifos exceedance occurred in Salt Slough @ Sand Ave (August), and Los Banos Creek at China Camp Road (January) no exceedance occurred at the monitoring location closest to the discharge point into the San Joaquin River (Salt Slough @ Lander Ave & Los Banos Creek @ Hwy 140), indicating that the load allocation was not exceeded during those monitoring events. The focus plan addressing water quality in the Salt Slough subwatershed was implemented in 2012. Additional focus plan activities in Salt Slough and Los Banos Creek subwatersheds will take place following approval of the Westside Coalition's Surface Water Quality Management Plan (SQMP).

Canal @ Hwy 99 (January), and in the Westside Coalition region at Marshall Road Drain near River Road (January, July).

- The load allocation in the combined Stevinson and Grassland subareas was potentially exceeded in January and August based on data showing chlorpyrifos exceedances in Los Banos Creek at China Camp Road (January), and Salt Slough at Sand Dam (August).

There was no exceedance of the load allocation in the combined Bear Creek and Fresno-Chowchilla and Tuolumne River, Northeast Bank, and Westside Creek subareas as there were no exceedances of the chlorpyrifos and diazinon WQTLs in the tributaries during the reporting period.

To address the chlorpyrifos exceedances observed at Highline Canal, the ESJWQC has been conducting Focused Outreach (2016-2018) in the site subwatershed. The Coalition also contacted one grower who most likely caused the chlorpyrifos exceedance in the Merced River, and provided pertinent information about pesticide use and exceedance in the site subwatershed. Additional focused watershed management plan outreach will take place in the affected subwatersheds in the Westside Coalition region as described in the Coalition's revised Surface Water Quality Management Plan (SQMP).

### **3. Determine the degree of implementation of management practices to reduce off-site movement of diazinon and chlorpyrifos**

Both Coalitions collect information that allows determining implementation of management practices through the Farm Evaluation surveys required of all Coalition members. The information collected was generally adequate to determine the degree of implementation of management practices to reduce the off-site movement of diazinon and chlorpyrifos.

As outlined in the revised Management Plan Strategy, the ESJWQC Coalition reviewed the members' farm evaluations in the Highline Canal site subwatershed to document current management practices implemented by growers, and recommended additional practices as necessary. The Focused Outreach initiated in 2016 is also ongoing in the Dry Creek @ Wellsford Rd, Duck Slough @ Gurr Rd, and Prairie Flower Drain @ Crows Landing Rd site subwatersheds. Also, the Coalition is developing a chlorpyrifos management plan for the Merced River subwatershed.

The Westside Coalition presented a summary of management practices inventory data for the site subwatersheds in the Coalition region (Table 25). The management practice information is presented as a percentage of irrigated acreage. Staff recommends the Coalition include the acreage value associated with % survey responses (i.e., irrigated acreage with implemented management practice/total irrigated acreage), and the number of growers who reported implementing those management practices. Also, a brief summary of additional or recommended management practices implemented after the Coalition outreach in site subwatersheds with persistent chlorpyrifos exceedances (e.g., Salt Slough) is important to understand the degree of implemented management practices and the effectiveness of the outreach.

### **4. Determine the effectiveness of management practices and strategies to reduce off-site migration of diazinon and chlorpyrifos**

Both Coalitions utilized monitoring results to evaluate the effectiveness of implemented management practices. Monitoring results from the tributaries of the San Joaquin River during

the 2016 WY indicate a significant decline in the number of chlorpyrifos detections and exceedances in both Coalition regions compared to the 2015 WY. However, in future TMDL AMRs the Westside Coalition should also provide data to document the association of water quality monitoring data with management practice information.

### **5. Determine whether alternatives to diazinon and chlorpyrifos are causing surface water quality impacts**

The TMDL report indicates that several potential alternatives to diazinon and chlorpyrifos have caused water quality impairments (organophosphates, carbamates, and organochlorines) in tributaries in the ESJWQC and Westside Coalition region. Pyrethroids were implicated to cause sediment toxicity and impaired water quality in sediment samples collected in the Westside Coalition region.

According to Figure 9 of the report, chlorpyrifos and diazinon applications have decreased over the last 12 years (2005 through the 2016 WY); only 27% of chlorpyrifos (51,073 lbs) and 9% of diazinon (1,967 lbs) were applied during the 2016 WY compared to the 2005 applications. In contrast, the use of alternative pesticides such as diacylhydrazine and pyrethroids has increased in recent years. The Westside Coalition listed pesticides that are most commonly applied in three counties in the Coalition region (Table 31). However, in future TMDL AMRs the Coalition should clearly indicate how alternative pesticides to chlorpyrifos and diazinon are used in the major crops in the Coalition region consistent with the information presented in Fig 10 of the TMDL AMR.

While it is difficult to determine if any of the detected pesticides in waterways was used as an alternative to chlorpyrifos and diazinon or as part of growers' pesticide management rotation, it is apparent from Figure 9 that a decline in the use of organophosphate pesticides, including diazinon and chlorpyrifos, coincide with increasing use of other groups of pesticides, such as diacylhydrazines, pyrethroids, carbamates, and neonicotinoids. Also, monitoring results show the use of these alternative products (e.g. pyrethroids) resulted in sediment toxicity in the Westside Coalition region.

### **6. Determine whether the discharge causes or contributes to a toxicity impairment due to additive or synergistic effects of multiple pollutants**

Water column and sediment toxicity monitoring results were used to indicate if additive or synergistic effects of multiple pesticides may be causing or contributing to toxicity impairment in the Eastside and Westside tributaries, and at three sites on the San Joaquin River monitored by the Westside Coalition. Toxicity to test organisms was not observed from samples collected by the Westside Coalition at the three compliance points on the San Joaquin River.

The ESJWQC reported that water samples monitored by the Delta RMP at the San Joaquin River at the Airport Way Bridge near Vernalis site showed no toxicity to *Ceriodaphnia dubia* and *Pimephales promelas*. In addition, there was no sediment toxicity to *Hyalella azteca* and water column toxicity to *C. dubia* and *P. promelas* from samples collected from the tributaries in the ESJWQC region. Therefore, the absence of toxicity in the tributaries and at Vernalis indicates that diazinon or chlorpyrifos are not contributing to an additive or synergistic impairment during the monitoring period.

In the Westside Coalition region, one water column sample toxic to *C. dubia* was associated with chlorpyrifos, and additional chemistry conducted on eight sediment samples indicated the presence of multiple pyrethroids; at least one pyrethroid was present in sufficient quantity to have caused the observed toxicity by itself. Therefore, it is unlikely that additive interactions

between pyrethroids and chlorpyrifos occurred in sediment samples collected in the Westside region.

### **7. Demonstrate that management practices are achieving the lowest pesticide levels technically and economically achievable**

The Coalitions track implementation and effectiveness of management practices in preventing off-site movement of pesticides through Farm Evaluation surveys reported by members, and additional information collected during focused outreach, as required. Overall, growers have been responsive and implemented additional or new management practices in the focused areas, but the extent to which management practices are achieving the lowest achievable pesticide levels that are technically and economically feasible varies across different subwatersheds.

Nonetheless, a decline in the number of detections and exceedances during the 2016 WY monitoring in the Coalitions' region is indicative of the effectiveness of the implemented management practices in reducing pesticides exceedances in the Coalitions region.

### **Conclusions**

- Monitoring goals described in the Basin Plan are largely being achieved.
- Water quality objectives for chlorpyrifos and diazinon in the San Joaquin River are being attained.
- Continued exceedances in some tributaries indicate that additional actions are required to meet water quality objectives.
- Continue main stem monitoring in the San Joaquin River to evaluate compliance with the water quality objectives.
- Water quality monitoring data should be associated with management practice information to evaluate the effectiveness of implemented management practices.
- The management practice inventory data provided by the Westside Coalition is presented as % of irrigated acreage; it would be useful to include the acres of implemented management practices.
- Management practice information should be summarized by subarea to evaluate the extent to which these management practices are achieving the lowest pesticide level.

**APPENDIX I**  
**Chlorpyrifos and Diazinon Annual Monitoring Reports Checklist**

San Joaquin River Chlorpyrifos and Diazinon 2016 Water Year Annual Monitoring Report				
Report Submittal Date: 1 May 2017			Review Date and Reviewer Name: 1 July 2017, Yared Kebede	
<b>Symbol Key</b> ✓ Item meets requirements X Incomplete Item/Not included – Not Applicable				
Item No.	TMDL AMR Component Name		Page Number	Comments
1	Signed Transmittal Letter	✓		
2	Title Page	✓		
3	Table of Contents	✓		
4	Executive Summary	✓		
5	Introduction	✓		
6	Monitoring Objectives and Design	✓	5-11	Monitoring objectives based on the Basin Plan requirements, and Coalition actions to meet the objectives are listed. Monitoring design aligns with the approved approach.
	Loading capacity: monitoring schedule and parameters at compliance points	✓	7-17; 21-22	The monitoring schedule fulfilled the load capacity site monitoring requirements, including location and frequency. No chlorpyrifos and diazinon exceedances occurred at the six compliance points in the San Joaquin River during the 2016 water year.
	Load allocations: tributary monitoring sites, parameters, schedule	✓	13-15; 29-34	Tributary monitoring schedule for chlorpyrifos and diazinon is summarized for areas east and west of the River.
7	Sampling Site Descriptions and Rainfall Records for the time period covered under the AMR	✓	12-18	In addition to the list of sampling sites, land use and top crops are summarized for the drainage areas represented by compliance points. Daily rainfall records for four locations in the ESJWQC and Westside Coalition region are provided in graphic form.
8	Location Maps(s) of sampling sites, crops, and land uses	✓	15	Location maps show sampling sites, and sources of data layers are identified on maps; NAD 1983 meets datum requirements. Land use and crop information are summarized in a table.
9	Tabulated Results	✓	Appendix I	A summary of chlorpyrifos and diazinon results is provided in the Appendices.
10	Data Discussion to Illustrate Compliance	✓	28-58	

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Item No.	TMDL AMR Component Name		Page Number	Comments
	OBJECTIVE 1: Determine compliance with established water quality objectives and the loading capacity applicable to diazinon and chlorpyrifos in the San Joaquin River	✓	28-29	The loading capacity and water quality objective were achieved.
	OBJECTIVE 2: Determine compliance with established load allocations for diazinon and chlorpyrifos	✓	29-34	Chlorpyrifos/diazinon exceedances occurred in two of the five subareas defined in the Basin Plan. There were a total of 4 exceedances of the WQO in the Westside Coalition region, and two in the ESJWQC region. <b>See memo.</b>
	OBJECTIVE 3: Determine the degree of implementation of management practices to reduce off-site movement of diazinon and chlorpyrifos	✓	35-40	Both Coalitions collect information from pesticide use and grower surveys that allows determining the degree of implementation of various management practices and their effect on discharges. However, additional or new management practices implemented in the Westside Coalition region should be summarized in the TMDL report. <b>See memo.</b>
	OBJECTIVE 4: Determine the effectiveness of management practices and strategies to reduce off-site migration of diazinon and chlorpyrifos	✓	41-44	Coalitions evaluated the reduction of off-site migration of chlorpyrifos and diazinon due to implementation of management practices. The effectiveness of the implemented management practices varies across different subwatersheds. <b>See memo.</b>
	OBJECTIVE 5: Determine whether alternatives to diazinon and chlorpyrifos are causing surface water quality impacts	✓	45-54	Results discussed in text indicates alternatives to diazinon and chlorpyrifos are causing water quality problems. <b>See memo.</b>
	OBJECTIVE 6: Determine whether the discharge causes or contributes to a toxicity impairment due to additive or synergistic effects of multiple pollutants	✓	55-57	Based on Tables 33 evidence suggests that alternative pesticides are causing water quality impacts in the Westside area. However, there is no evidence of synergistic or additive effects causing toxicity. <b>See memo.</b>
	OBJECTIVE 7: Demonstrate that management practices are achieving the lowest pesticide levels technically and economically achievable	✓	58	<b>See memo</b>
11	<b>Electronic data submitted in a CEDEN comparable format</b>	✓	CD	ESJWQC and Westside Coalition field and lab data submitted in a CD with the report and uploaded into a CEDEN comparable database.
12	<b>Sampling and analytical methods used</b>	✓	19-20	Sampling (collection containers, sample preservation, holding times, field measurements) and analytical methods are summarized. Both Coalitions use appropriate analytical methods with low detection limits.
13	<b>Copies of chain-of-custody forms and sample receipt documentation</b>	✓	CD	Copies of all COCs are included, legible and completely filled out; there were no anomalies affecting diazinon and chlorpyrifos TMDL samples during the 2016 WY monitoring.
14	<b>Field Data Sheets, Lab Reports, Lab Raw Data</b>	✓	CD	Copies of all field data sheets completed and presented on CD. All analytical reports are signed by authorized laboratory representative. Included are sample results with units, RLs and MDLs; sample preparation, extraction and analysis dates; results for all QC samples: field and laboratory blanks, lab control spikes, matrix spikes, field and laboratory duplicates, surrogate recoveries; and chemistry lab narrative describes all QC failures, analytical problems and anomalous occurrences.

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Item No.	TMDL AMR Component Name		Page Number	Comments
15	Associated laboratory and field quality control samples results	✓	Appendix II	Chemical analyses include: field blank, field duplicate, lab blank, matrix spike and MSD, lab control spike and LCSD, surrogate recovery, and results are included in the TMDL AMR.
16	Summary of Quality Assurance Evaluation results	✓	23-26	Acceptance criteria for all field and laboratory QA/QC measurements are identified and in agreement with the ILRP requirements, summaries of accuracy and precision are included, field and laboratory completeness are calculated and reported, and overall Project completeness is determined. Field and laboratory completeness met or exceeded the 90% completeness goal, and >90% of samples met the holding time requirements for chemistry analyses. Data are appropriately flagged in cases where QA/QC results that did not meet acceptance criteria.
17	Flow Monitoring Method(s)	✓	20	Discharge method and gauge for the compliance points in the San Joaquin River are listed in the TMDL AMRs, and Coalitions' QAPP's are referenced for discharge measurements at tributaries.
18	Monitoring Site Photos	✓	CD	
19	Summary of Exceedance Reports submitted during the reporting period and related pesticide use information	✓	19-34	Summary of all Exceedance Reports submitted during the TMDL AMRs period are included and match previously reported exceedances.
20	Actions Taken to Address Water Quality Exceedances	✓	35-39	
21	Status update on preparation and implementation of all management plans and other special projects	✓	35-36; 39	An update on status of all Management Plans and special projects that are in preparation or being implemented are provided in the ESJWQC's Annual Report, and Westside Coalition's AMR.
22	Conclusions and Recommendations	✓	59	